About this course

The goal of this course is to provide an in-depth understanding of the fundamental concepts and challenges in the area of mobile computing and study the existing and proposed solutions for these challenges from both a research and development perspective. Several topics, including mobile app development, wireless communication, mobile technology management, mobility tracking, context awareness, and programming applications on mobile systems, will be covered in this course. Course work will involve programming assignments, discussions, quizzes, and a project.

Specific topics covered include:

- Mobile programming
- Internet of Things (IoT)
- Edge and cloud computing
- Mobile networking
- Mobile information access
- Adaptive applications enabled by machine learning and AI
- Energy-aware systems
- Location-aware computing
- Mobile security and privacy

Required prior knowledge and skills

- Networking
- Operating Systems
- Security
- Probability
- Statistics
- Algorithms

Learning Outcomes

Learners completing this course will be able to:

- Design a context-aware application.
- Identify the advantages of using context in applications.
- Explore the challenges arising due to changes in the environment in which computation is performed.
- Identify relevant environment changes and analyze their causes, such as mobility, availability of data, and resource constraints.
- Define smartness and identify salient features that distinguish smart applications from traditional ones in the context of smart city, smart grid, smart transportation, smart mobile applications, and autonomous systems, such as autonomous cars.
- Describe key features of Internet of Things (IoT) and design a distributed smart application using IoT.
- Define cloud computing, crowdsourcing, volunteer computing, and other novel variants of pervasive computing.
- Analyze nonfunctional requirements of smart mobile applications, such as safety security sustainability.
- Apply popular tools, such as machine learning, security protocols, AI, and software testing, to validate
safety security and sustainability of smart mobile applications.

- Acquire programming skills on popular mobile platforms, such as Android.
- Develop, end-to-end, a sensor-enabled smart autonomous practical application.

**Estimated Workload/Time Commitment Per Week**

15 - 20 hours per week

**Technology Requirements**

**Hardware**

- Memory: At least 2GB RAM (4GB RAM recommended)
- Processor: At least 1GHz (2GHz or more recommended)
- Operating System: Windows 7 or higher / OS X v10.7 or higher

**Software and Other (programs, platforms, services, etc.)**

- Android Studio Integrated Development Environment (IDE) with the software development kit (SDK) bundle (check the system requires for Android Studio on their website)
- You can utilize either MatLab or Python for the programming assignments

**Creators**

![Image of Dr. Ayan Banerjee]

**Dr. Ayan Banerjee**

Dr. Banerjee is an Assistant Research Professor at the School of Computing Informatics and Decision Systems Engineering, Arizona State University. His research interests include pervasive computing in healthcare and analysis, safety verification of embedded system software. Dr. Banerjee currently focuses on data driven analysis and modeling in many different domains including diet monitoring, gesture recognition, and biological process modeling. He works closely with government agencies such as Food and Drug Administration and medical agencies such as Mayo Clinic. Dr. Banerjee is also interested in hybrid system-based modeling and safety verification of closed loop control systems which interact with the physical environment, also known as Cyber-Physical Systems. In addition, his work includes developing management algorithms for sustainable data centers using renewable sources of energy.